EXPERT REVIEWS ON USING AUGMENTED REALITY IN MOBILE FLIPPED LEARNING MODULE

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This study aimed to identify experts' views on using augmented reality in the mobile flipped learning module. A mobile flipped learning module was developed with the integration of Kolb's experiential learning theory and Brame's model. The module was introduced to and implemented in the final year students at a private university. The researchers briefly explained the practices or steps involved in the implementation of the mobile flipped learning approach. This study used a qualitative research methodology. The iinterviews were evaluated by two panels of experts. The findings highlighted the experts' positive remarks on the mobile flipped learning module. From the findings, the researcher found that this study has implication to educators, especially in Malaysia on using the mobile flipped learning approach and the steps proposed in the module. Further research is needed to thoroughly explore the effectiveness of implementing mobile flipped learning as compared to the traditional method.

Keywords: *Mobile Flipped Learning, Augmented Reality, Kolbs' Experiential Learning Theory, Brame Model*

In the 1990s, mobile computing had slowly and steadily gained popularity (Evans & Matthew, 2013). By introducing smartphones and tablets, everyone from the young to the professionals and veterans can now access the technology, depending on their need and usage. Referring to Bates (2012), the flipped classroom is a new approach where the teacher encourages his or her students to study new topics outside the classroom, then conducts activities or exercises in the classroom to strengthen students' understanding. Meanwhile, mobile learning is a potential approach for learners who are moblie or suitable for a classroom where the modern devices are limited and students can pass them easily from hand-to-hand or can share them in a group (as in the case of a tablet). As we are moving towards a new era of technology, rapid change of conventional devices into the new updated and modern technology has become the norm. The flipped classroom is one of the new pedagogical approaches especially in Malaysia's educational field (Embi, Hussin &Panah, 2014).

Salleh and Aziz (2012) reported that the teaching style that has been implemented in Malaysia is still using a teacher-oriented approach where the teacher emphasizes using the traditional learning method. The traditional learning practices tended to adopt a one-way

communication and were proven to have failed to educate students in higher-order thinking or the problem-based approach. Students were not given a chance to explore the concept involved and blindly accepted whatever information given by the teacher without questioning it (Khalid & Azeem, 2012). Li (2015) stated that nowadays the usage of technology in the learning activity is necessary because students play the role of digital natives and they are highly connected to the technology in their daily lives. However, not all students are attracted to being engaged in online learning or mobile-learning. They are influenced by their primary school learning method which teachers used to apply the traditional ways of teaching (Abu & Ismail, 2012). Moreover, Luaran, Alias and Jain (2014) noticed that by using the flipped learning approach, students would assume that there would be fewer classes or meetings, which meant that there would be less work for the subject and it became problematic to ensure that students could manage and be responsible for their learning.

Rahamat et al., (2013) indicated that apart from the computer, Internet access can also be found in mobile technology such as the mobile phone and laptop. This means that by having the devices, students can access the Internet and enjoy the Android or iOS application related to the learning. However, referring to a study done by Jambulingam and Sorooshian (2013), even though the student-owned the mobile phone with Internet access, their tendency is more towards downloading music or games and engaging in social networks rather than utilizing it for learning purposes.

Nowadays, most of the students have at least one mobile phone and other devices such as a laptop or MP3 where they normally use as their socialization or entertainment tools. This statement was supported by Song, Murphy and Farley (2013) in their research where they found that a large number of students used a computer to access e-learning and their university's Learning Management System (LMS), also searching for other educational materials and notes. Students less frequently use mobile phones for learning purposes whereas they prefer to use the gadget for entertainment, socialization, or leisure activities.

The use of the augmented reality (AR), especially via mobile phone has been successfully implemented in various subjects such as Mathematics, Science, and languages for pre-school students (Abd, 2013), there is still a lack of study on the use of mobile flipped learning in correlation with the augmented reality to improve the motivation, learning, and engagement in learning multimedia and animation subject. Students in this university have been exposed to 2D animation by using specific software (for example Adobe or Flash) installed in the animation lab. As all the teaching activities are done in the classroom, they are having the 'desktop-first, mobile-second' mindset, and feel more pleasant doing animation works using the desktop. Furthermore, Mahamad, Ibrahim and Mohd Taib (2010) stated that the design of mobile phone screen size contributes to the limitation of the student's interest to support their learning activity because it is smaller compared to a desktop.

Moreover, from reading, the researchers found that most of the studies related to flipped classroom done by researchers are from other countries (Nederveld & Berge, 2015; Simpson & Richards. 2015; Touchton, 2015; Morgan, 2014; Tune et al., 2013; Milman, 2012; Sams & Bergmann, 2012). There are only a few local researchers who did a study about flipped classroom in Malaysia. Rahman et al., (2014) studied the flipped classroom within the Malaysian context. Jamaludin and Osman, (2014) concentrated more on the usage of the flipped classroom to enhance engagement and promote active learning among students. A study by Jamaludin, Osman and Mokhtar (2014) focused on lecturers' and students' perception between the flipped classroom and traditional classroom approaches among the Malaysian Polytechnic community. Johary (2015) did a study on the flipped classroom implementation at the Defence University, Zainuddin and Attaran (2015) focused on students' perception of the flipped classroom while Halili and Zainuddin (2015) dwelt into

the use of flipped classroom and its impact on the learning and teaching activity. From all the literature available within the Malaysian context, it shows that only one researcher did a study on mobile learning flipped classroom. The study focused more on the implementation of the flipped classroom using SMS and WhatsApp for class notification and discussion group for Physics subject (Idrus, 2015). According to Embi, Nordin and Panah (2013), there is still the need in mobile learning research focusing on mobile flipped learning especially in Malaysia, to make it more accessible to relevant parties.

The use of augmented reality in mobile-flipped learning

In introducing AR to the students, Klopfer and Squire (2008), noticed that augmented reality is an innovative technology that involves the overlay of computer graphics in the real world. Supported by Nincarean et.al. (2013), it reported that augmented reality is a new technology introduced to improve the pedagogical approach. Azuma (1997), defined the augmented reality as a technology that allows computer-generated virtual imagery information to be overlaid onto a live direct or indirect real-world environment in real-time. Azuma et. al. (2001) defined augmented reality as an interactive real-time by combining the real world and virtual world with 3D elements. Augmented reality is lagging far behind and not much discussed as well as explored by the researchers especially in Malaysia (Phon. et al., 2014). Even though augmented reality has existed since the 1960s, many people especially instructors and learners are still unfamiliar with its existence.

Musa, Ziatdinov and Griffiths (2013) reported that most of the research in animation subjects is focused on the efficiency and effectiveness of instructional techniques in the multimedia subject and the usage of multimedia to improve the quality of learning. This could be a potential signal to the researcher to study the application of augmented reality in mobile flipped learning. The researcher has acknowledged that students have experienced an excellent learning environment and it contributes to a positive outcome when they choose to apply mobile flipped learning into their learning process.

In ensuring the successfulness of the flipped classroom approach, learning is one of the major parts that contribute a high impact on the learners in using technology. According to Houwer, Barnes-Holmes and Moors (2013), learning can be defined as a consequence of experience on behavior. Learning with technology refers to the instructor or learner who uses the technology to promote learning and gain knowledge from the learning activities (Mayer, 2010). The main role of technology is to help and guide learner's cognitive process. With the use of technology such as a multimedia presentation or virtual reality image during the learning process, it plays a role to deliver information to the learner. According to Rau, Gao and Wu (2006) reported that learning becomes more efficient when students use technology to communicate with the instructor or among themselves to complete the tasks given.

Mobile flipped learning is an approach when mobile phones become full technology in use and the learners that use the technology are also mobile when they intend to learn (El-Hussein & Cronje, 2010). The integration of using mobile in flipped learning can be defined as learning activities by using mobile devices or mobile technology with an FC approach. According to Hwang et. al., (2013), in the MFL context, the combination of wireless communication and mobile devices can assist the learning flow in a different context, social and physical spaces. This statement was supported by Song et. al., (2013) in their research where they found that a large number of students used a computer to access e-learning and their university's learning management system, also searching for other educational materials and notes.

Augmented Reality (AR) is a state-of-the-art technology through which students can engage and witness practical experience in interactive and real-time applications. AR takes

and mixes new knowledge with an existing image. In the classroom and community where students work, AR can understand (Rasalingam et. al., 2014). Klopfer and Squire (2008), who presented AR to the students found that virtual reality is a groundbreaking technique involving computer graphics in the real world. It stated that AR is a modern technology built for the improvement of the pedagogical method with the help of Nincarean et al., (2013). Some studies have been done in AR but fewer studies have been found especially in Malaysia in the field of education. It facilitates learning by students with a minimum reliance on their instructor in a school by using AR in MFL. It inspiring the student to collaborate with other peers and leading the teacher to address the issue in class, rather than delivering a lesson. By using a mobile learning approach, this approach becomes successful and can be used conveniently in all places and periods by several students. This research, therefore, concentrated on the validity of AR by experts in the MFL module. The research question to be addressed in this study is: What is the experts' review of using AR in the MFL module?

Methodology

The study was conducted in a private university located in the heart of Kuala Lumpur with the university having another 13 campuses within the Peninsular of Malaysia. The management of the university has provided a high-quality *Wi-Fi* service to all students and staff, whether inside or outside the classroom. The service was openly provided to all students so that they can easily access the Internet using their laptops, tablets, PDAs, or smartphones. It can be used 24 hours a day to support students who wish to use Internet resources for their academic purposes. Multimedia and animation are a compulsory subject for those students enrolled in a program under the creative multimedia section. The reason for selecting multimedia and animation course in this study is because the students have been exposed to augmented reality technology and it relates to their subject and project-based activities. The lecturers are experts and they exposed themselves to augmented reality technology to improve their students' skills and knowledge to produce an animation or multimedia output.

This study used Kolb's experiential learning theory. According to McLeod (2013), Kolb's experiential learning focuses on the learner's internal cognitive process. Experiential means something related to or resulting from the experience. Kolb's experiential learning styles are separated into four (4) stages; there are four (4) stages of learning cycles which are 1) Concrete Experience, 2) Reflective Observation, 3) Abstract Conceptualization and 4) Active Experimentation. In executing Kolb's into the mobile-flipped classroom approach, students are more responsible for their learning activities, by studying the learning content before the lesson starts whether individually or in the group (The University of Queensland, 2015). Students apply the knowledge and skills gained from their experience to participate in the activity given by the teacher. In this context, the students start with concrete experiences to gather as much as possible knowledge and information before attending the class by using Aurasma to experience augmented reality. Then, in the reflective observation stage, students are allowed to review the knowledge gained from previous tasks and related experience gained in completing the tasks. Next, in the abstract conceptualization stage, students need to interpret and understand the relationships that exist among the new knowledge learned. In the final stage, it allows students to absorb new knowledge and transforms it into a projection of what is going to happen next or the action that needs to be taken to refine the way of completing the tasks.

MFL module was introduced and implemented on final year students, especially in developing the animation or multimedia prototype and final year project. The researchers briefly explained the practices or steps involved in the implementation of the mobile flipped

learning approach. The processes were adopted from Brame (2014) and New York University's "Steps to Flipping Your Class" approach which includes the scope and objectives, pre-class content, pre-class activities, in-class activities, and post-class activities. There are five steps involved in the module, and it is a combination of Brame and Kolb's theory. For stage 1: scope and objectives, the lecturer determines the objectives of the learning process to ensure that students will learn and gain some knowledge from the learning activities. For stage 2: pre-class content, the lecturer prepares the instruction materials or mechanisms to deliver the content to the students. The lecturer chooses Aurasma; an attractive mobile application to present AR technology, where this could motivate students extrinsically to explore deeper into video-making using AR. Next, stage 3: pre-class activities, lecturer creates an activity that can motivate students and attract them to the learning content. Students are required to prepare a short presentation on AR and points or marks will be given to each task completed by them. With Kolb's theory, students will be facing a few issues in understanding the practicality of the application. For stage 4: in-class activities, the lecturer plays a role to facilitate learning which can provide better learning among the students. Referring to Kolb's theory in the 'Abstract Conceptualization' stage, students are exposed to the more sophisticated application of knowledge. They demonstrate and apply the understanding through projects or model building. Finally, for stage 5: post-class activities, the lecturer gives an exercise or homework to the students to complete. In relation to Kolb's theory, students understand the ways of using AR to create a character and they can transform their understanding by improving or creating more advanced movement on the part of an existing character.

This study was conducted using a qualitative research approach such as interview and rubric. Data from the interview were analyzed and categorized into themes. The researcher chooses to implement the semi-structured interview because it allows more flexibility, semi-formal (casual), and freedom in communication. A semi-structured interview is a freestyling interview relative to a structured interview (Kajornboon, 2004). To implement the interview questions in this study, the researcher carries out a few modifications to suit the objectives of this study, related to the research topic based on established interview questionnaires from Serin (2012) and Zainuddin (2015), to explore in-depth the application of AR in the MFL module.

The researcher has selected two (2) experts who are involved in this area. Referring to Hsu and Sandford (2007), the expert must possess their capability and command of their battlefield, besides knowledgeable on the concerned topics. While Keeney et.al., (2011), noted that there is no specific number of experts to be nominated as an expert, the main criterion to select an expert is that a person should have more than ten (10) years of experience in teaching and mastering knowledge. The selection of experts is based on their experience and expertise. In this research, the selection of experts aims to give important input to the researcher while improving and validating a few items in this research. The experts will contribute an idea, comment, and improvement to the rubric and mobile flipped learning module as proposed by the researcher. Two experts were interviewed and validated the module based on the rubric. Therefore, in this research, one of the experts is a lecturer who was appointed by the university, coordinates and leads the usage of instructional tools among other lecturers. She has more than 6 years of experience in conducting and handling instructional tools, and she encourages the usage to all lecturers. According to Akbari (2014), recognition, or nomination by the school can be considered as an indicator of teaching expertise. Another expert is a senior lecturer who is knowledgeable in the usage of AR in animation and multimedia for more than 5 years. They encourage and expose students to use

AR and implement an MFL approach in the teaching process. He was also involved in a few student projects related to AR applications.

The interview session is scheduled at one specific time by separating the panelist at different times. To facilitate the collection of data, a voice recorder was used with permission from the respondents. They were free to communicate in Malay or English as long as they could provide meaningful input to the research. The interview session was done in forty-five minutes each with good participation from all respondents. To validate the module, the experts were given a rubric to measure the practicality of the module after the interview ends.

Findings and Discussion

The process of the findings of this study began with the analysis of the expert's interview, continued with the rubric validation. To facilitate the researcher in reporting findings, both experts' feedback has been labelled Expert 1 (E1) and Expert 2 (E2). Three major themes emerged during the expert's interview:

Authentic Learning Experience

Based on the question asked, E1 responded that AR is one of the latest technologies which is more economical when they use their own mobile devices to experience augmented reality compared to other permanent and high technology devices such as a head-mounted display (HMD). E1 added, that previously, the chalk and talk style can only expose the students to theoretical knowledge without practical exercise. By using the MFL module, students can learn better and experience knowledge before they even start the lesson. Students can demonstrate AR by installing the applications into their mobile devices. They can easily create the animation and multimedia character at their own pace and time. E1 said that considering students' basic understanding and experience in Stage 1 of the module, will give a good impact on their learning because the lecturer must ensure that the students have some basic understanding before the class starts while in the traditional setting, it does not consider this. Besides, Stage 3 also encourages students to learn on their own before attending the class. The statement was supported by E2 because recently, he has implemented the MFL approach instead of traditional learning. E2 stated further:

> *". . . I have used this method for a couple of semesters ago. This approach gives a lot of benefit and improvement to the students. . ."* (E2, interviewed on 10/4/19, L45-46)

In conclusion, both findings from E1 and E2 consistently agreed that the MFL module was able to create active learners' environment compared to the traditional approach which focuses more on the teacher-centered approach. As stated in Stage 3 of the module, students can independently make a discovery and gain knowledge with less dependence on the lecturer. They can also experience the AR technology easily by using their own mobile devices, rather than learning about the technology theoretically. Referring to the module, both experts recommended using mobile devices in learning AR since technology is more modernized and attractive compared to the traditional approach. This was supported by Kesim and Ozarslan (2012) who stated that the combination of AR and current technologies can enhance the effectiveness and bring more attraction to the students especially when they experience a real-life scenario. Saidin et. al., (2015), stressed that the use of technology helps lecturers to explain well to the students and make them easily digest the knowledge that has been taught to them. The statement was harmonious with Craig (2013), who stated that mobile technology is cheaper compared to permanent or special-purpose technologies such as

HMD, handheld devices, and others. The finding was also supported by Jacob and Isaac (2007), who went on to state that one of the mobile learning benefits is that it is easy to access, where students can utilize it on-demand.

Meaningful Experience

Referring to the interview findings, E1 stated that the MFL module can expand students' learning time with no constraints because the devices can be accessed anytime and anywhere. This approach gives a more learner-centered experience where the students can prepare themselves with prior knowledge before they start the class. They can also manage their time accordingly in learning and understanding the topic before entering the class, where this can shorten the face-to-face consultation with the lecturer. Lecturers only play the role of a facilitator during classes to brief about the topic or correct their understanding and evaluate what they have understood. E1 claimed that in this digital era, most of the students own mobile devices and they choose to learn to use their gadgets outside the classroom because the attachment of the devices is very high. This is congruent with Stage 3 practices in the module where it is flexible for the students to learn at their place and time as the pre-class activities. E1 said:

> *"..... They Google everything they want to know, hahaha (Laughing). . . ."* (E1, interviewed on 10/4/19, L32-35)

Besides that, E1 also responded that by implementing the MFL module, students can communicate with their peers or lecturer using an online face to face medium immediately. They can discuss, deal with, and ask about the topic using the online connection and this saves a lot of time and effectively encourages the learning process. According to E1, students nowadays need a fast response to attend to their needs where MFL helps them to fulfill the requirements and indirectly, supports them to learn and understand better about what they have learned. E1 mentioned that students in this new digital era were different from students ten or twenty years ago. Their eagerness to know about something makes them act fast compared to the previous students who would passively wait until they met the lecturer at the college or during their classes.

Meanwhile, in this section, E2 commented:

> *". . . the students were excited when they were asked to explore AR using their own devices. I have implemented what Stage 3 in the module stated and it works for the students to learn better. They have explored AR with minimum supervision . '*(E2, interviewed on 10/4/19, L47-49)

As a conclusion for this theme, the researcher found that the MFL module can influence the students to learn better and understand more about the topic. The approach also teaches them the ability to prepare new meanings before and during the class session as the technology allowed them to study at their own pace and in their own time. This shows that the MFL module can give an impact on the students' learning experience where both experts responded that it can contribute to a positive learning culture among the students. Oberer (2016), in his study, noted that the combination of the flipped classroom and mobile technology gives a direct impact on student's learning outcomes in which they could understand better. This finding was in line with that of Baker et. al., (2014), who agreed that learning AR through mobile devices promote students' learning and produce a more effective learning environment.

Encourage students to use mobile flipped learning

The researcher has asked both experts for their recommendations or comments on the application of augmented reality using the MFL as an instructional tool. E1 has responded positively by encouraging more lecturers and educators to start looking for an MFL approach because of this new decade, the students are technology-savvy and they prefer to use more updated tools rather than settling in the traditional learning. She added that the lecturer needs to ensure the attractiveness of the content to raise students' attention towards MFL methodology. E1 said:

> *". . .Overall, I think we don't have any problem because nowadays, all students own smartphones and other devices. . ."* (E1, interviewed on 10/4/19, L137-142)

Meanwhile, E2 also agreed about starting to use the MFL styles to achieve mastery in AR, especially among animation and multimedia students because the technology is more updated, portable, and economical where all students can afford to own mobile devices. He also recommended expanding more features and free applications to encourage students' creativity in making better artwork and project presentations . E2 concluded:

> *". . . MFL is great. I would say it will be better to have more free applications and improve the features. . ."* (E2, interviewed on 10/4/19, L143-144)

The feedback was supported by Liu and Chu (2010) that the flexibility, easy access, and internet connectivity make the learning *–on the go* as the students are characteristically Gen-Y and they prefer to use the technology rather than the traditional method.

Conclusions and Further Research

In this modern century, the implementation of traditional classrooms appears to be irrelevant to the new era of educational technology (Salleh & Aziz, 2012). Therefore, to attract students' attention to the learning activities, the instructional designer has created a few ways to learn better and one of them was learning AR using mobile devices. This study has a prospect of the educational system because it can be one of the references in academic research and Malaysia's education system to enhance the public's understanding, especially university students towards learning AR through MFL. From the results, the experts have a positive perception of the implementation of mobile flipped classroom in teaching and learning using the AR application. The finding of this research was consistent with the theory of learning proposed by Kolb (Clark, 2012). In this study, students practiced the earlier cycle (concrete experience and reflective observation) outside the classroom while they were practicing the next cycle (abstract conceptualization and active experimentation) during the class session.

From the findings, the researchers found that this study has implications for educators, especially in Malaysia on using the MFL approach and the steps proposed in the module. As the majority of them are still using the traditional approach which was teacher-centered and with only a few moving into the student-centered method, the module could become proper guidance to those who intended to switch their '*old way*' of teaching style into the most effective methodology. With a step by step direction, the module can be used as a '*kick-start*' before they become an expert. The module was beneficial to the lecturer who

intended to shift their teaching methodology into the most current and updated digital technology.

Meanwhile, referring to the experts' positive perception towards mobile learning, this can be a '*signal'* to authorities to determine the use of mobile flipped approach into the current educational pedagogy because students nowadays prefer that they learn through the technology, rather than using the traditional '*chalk and talk*' approach. The research finding was able to support the learning system in Malaysia, especially among the university's top management to ask their instructor to start to transform the pedagogical system from a teacher-centered to a students-centered method. Likewise, it also can be one of the references for another researcher to explore deeper into MFL and AR.

Even though this study has illustrated positive feedback from experts in validating the module, there is still room for improvement to address in future research as the current study has some limitations and scope. Further research is needed to explore thoroughly the effectiveness of implementing MFL compared to the traditional method and how it can improve students' learning to become more effective and efficient. The results and findings can be used by the stakeholders or policymakers in deciding on the best way to conduct teaching and learning activities for the students. The policymakers and other authorities need to determine the use and implementation of mobile flipped learning as a new pedagogical approach to extend more attention and gain the highest level of fascination among students in ensuring a more effective learning experience.

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